CLAIMS

1. A process for de-interlacing a video signal, the process comprising:

producing a de-interlaced video output signal by interpolating a plurality of pixels missing from an interlaced video input signal;

wherein the interpolation performed on the output signal is produced from a selection of spatial interpolation and a temporal interpolation;

wherein a determination is made on a variable degree of presence of at least one of the spatial interpolation and the temporal interpolation in the output signal, the determination being made as a function of a detection of motion in a portion of a video image being interpolated; and

wherein the determination includes a detection of a detail in the portion of the video image.

2. The process according to claim 1, wherein the determination is made in respect of each individual interpolated pixel in the plurality of pixels inserted into the output signal.

3. The process according to claim 1, wherein the spatial interpolation is made on the basis of a determination of a selected direction, among a series of directions under consideration connecting pixels on different lines of a given pixel window, for which a minimum difference is obtained between values of the pixels on the different lines so as to connect along the selected direction, and in that one of the directions in the series of directions corresponds to an angle of approximately 26° relative to a vertical direction, for a geometry with a pixel pitch equal in the vertical direction and a horizontal direction.

4. The process according to claim 1, wherein the spatial interpolation is made on the basis of a determination of the selected direction, among a series of directions under consideration connecting pixels on different lines of a given pixel window, for which the minimum difference is obtained between values of the pixels on the different lines so as to connect along the selected direction, and in that one of the directions in the series of directions corresponds to an angle of approximately 63° relative to a vertical direction, for a geometry with a pixel pitch equal in the vertical direction and a horizontal direction.

5. The process according to claim 3, wherein the spatial interpolation is made on the basis of a determination of the selected direction, among a series of directions under consideration connecting pixels on different lines of a given pixel window, for which the minimum difference is obtained between values of the pixels on the different lines so as to connect along the selected direction, and in that one of the directions in the series of directions corresponds to an angle of approximately 63° relative to a vertical direction, for a geometry with a pixel pitch equal in the vertical direction and a horizontal direction.

6. The process according to claim 1, wherein the spatial interpolation is made on the basis of a determination of a selected direction, among a series of directions under consideration connecting pixels on different lines of a given pixel window, for which a minimum difference is obtained between values of the pixels on the different lines so as to connect along the selected direction, and in that when there are several directions producing a same minimum difference between the values of the pixels so connected, a direction closest to a vertical direction is selected.

7. The process according to claim 5, wherein the spatial interpolation is made on the basis of a determination of a selected direction, among a series of directions under consideration connecting pixels on different lines of a given pixel window, for which a minimum difference is obtained between values of the pixels on the different lines so as to connect along the selected direction, and in that when there are several directions producing a same minimum difference between the values of the pixels so connected, a direction closest to a vertical direction is selected.

8. The process according to claim 1, wherein the spatial interpolation is made on the basis of a determination of a selected direction, among a series of directions under consideration connecting pixels on different lines of a given pixel window, for which the minimum difference is obtained between values of the pixels on the different lines so as to connect along the selected direction, and in that when there are two diametrically opposed symmetrical directions producing a same minimum difference between the values of the pixels so connected, a vertical direction is selected.

9. The process according to claim 7, wherein the spatial interpolation is made on the basis of a determination of a selected direction, among a series of directions under consideration connecting pixels on different lines of a given pixel window, for which the minimum difference is obtained between values of the pixels on the different lines so as to connect along the selected direction, and in that when there are two diametrically opposed symmetrical directions producing a same minimum difference between the values of the pixels so connected, a vertical direction is selected.

10. The process according to claim 1, wherein the spatial interpolation is made on a basis of an averaging of pixel values, and wherein identical pixel positions are taken to determine both an averaging of the luma component of the interlaced input video signal and an averaging of the chroma component, insofar as the identical pixel positions are available for the luma component and the chroma component.

11. The process according to claim 9, wherein the spatial interpolation is made on a basis of an averaging of pixel values, and wherein identical pixel positions are taken to determine both an averaging of the luma component of the interlaced input video signal and an averaging of the chroma component, insofar as the identical pixel positions are available for the luma component and the chroma component.

12. The process according to claim 1, wherein the spatial interpolation is made on a basis of a determination of a selected direction, among a series of directions under consideration connecting pixels on different lines of a given pixel window, for which a minimum difference is obtained between values of the pixels on the different lines so as to connect along this direction, and

wherein the determination is made on a luma component of the input signal, and in the given direction so determined is also used as an interpolation direction for the chroma component of the input signal.

13. The process according to claim 11, wherein the spatial interpolation is made on a basis of a determination of a selected direction, among a series of directions under consideration connecting pixels on different lines of a given pixel window, for which a

minimum difference is obtained between values of the pixels on the different lines so as to connect along this direction, and

wherein the determination is made on a luma component of the input signal, and in the given direction so determined is also used as an interpolation direction for the chroma component of the input signal.

14. The process according to claim 1, wherein the motion detection is carried out, for a given pixel of the plurality of pixels, by a recursive calculation implementing an intermediate motion value loop M0 with attenuation by a factor of less than 1.

15. The process according to claim 14, wherein a motion value M is determined for a pixel for interpolation X of a field m by the following algorithm:

M0=max(|A-D|,FA*M(N)),

Mp=min(M(N1),M(N1+1)),

M=max(M0,Mp),

where:

A is a pixel in a same position as a pixel X, but in a field m+1,

D is a pixel in a same position as the pixel X, but in a field m-1,

M(N) equates to a value M0 calculated one frame before, with N being a total number of lines in the image,

M(N1) equates to the value M0 calculated N1 lines before,

N1 = (N-1)/2 when N being odd-numbered,

N1 = (N-2)/2 when N being even-numbered and a luma lines for interpolation being a series of even numbered lines of the image,

N1 = N/2 when N being even-numbered and the luma lines for interpolation being a series of odd numbered lines of the image,

N1 = N/2 when N being even-numbered and the luma lines for interpolation being the series of odd numbered lines of the image, and

M(N1+1) equates to the value M0 calculated (N+1) lines before, and

FA is the attenuation factor.

16. The process according to claim 14, wherein the attenuation factor FA is equal to 15/16.

17. The process according to claim 15, wherein the attenuation factor FA is equal to 15/16.

18. The process according to claim 1, wherein a weighting for the selection of the spatial interpolation and the temporal interpolation is determined on a basis of a luma component of the input signal.

19. The process according to claim 18, wherein the interpolation is determined on the luma component of the input signal is obtained by the following algorithm:

$$I=med(s,t+M,t-M) \text{ if } M\leq d$$

$$\text{otherwise } I=s,$$

where I represents the final interpolation,

s represents the spatial interpolation,

t represents the temporal interpolation,

M represents the motion measurement at a position for interpolation,

D represents the detail measurement at the position for interpolation, and

med (a,b,c) represents the median function of a,b,c.

20. The process according to claim 19, wherein the selection is made on the basis of the luma component of the input signal is also applied to a chroma component.

21. The process according to claim 20, wherein the interpolation includes one or more of the following:

when a final interpolation on the luma component is closer to the temporal interpolation, the final interpolation of the chroma component is the temporal interpolation; and

when the final interpolation on the luma component is closer to the spatial interpolation, the final interpolation of the chroma component is the spatial interpolation; and

when the spatial interpolation and the temporal interpolation have an equal contribution in the final interpolation of the luma component, the spatial interpolation and the temporal interpolation have an equal contribution in the final interpolation of the chroma component.

22. A device for de-interlacing a video signal, comprising:

means for producing a de-interlaced video output signal by interpolating a plurality of pixels missing from an interlaced video input signal;

wherein the interpolation performed on the output signal is produced from a selection of spatial interpolation and a temporal interpolation;

wherein a determination is made on a variable degree of presence of at least one of the spatial interpolation and the temporal interpolation in the output signal, the determination being made as a function of a detection of motion in a portion of a video image being interpolated; and

wherein the determination includes a detection of a detail in the portion of the video image.

23. The device according to claim 22, wherein the means determines a weighting for each individual interpolated pixel in the plurality of pixels.

24. The device according to claim 22, wherein the spatial interpolation is made on the basis of a determination of a selected direction, among a series of directions under consideration connecting pixels on different lines of a given pixel window, for which a minimum difference is obtained between values of the pixels on the different lines so as to connect along the selected direction, and in that one of the directions in the series of directions corresponds to an angle of approximately 26° relative to a vertical direction, for a geometry with a pixel pitch equal in the vertical direction and a horizontal direction.

25. The device according to claim 22, wherein the spatial interpolation is made on the basis of a determination of the selected direction, among a series of directions under consideration connecting pixels on different lines of a given pixel window, for which the minimum difference is obtained between values of the pixels on the different lines so as to connect along the selected direction, and in that one of the directions in the series of directions corresponds to an angle of approximately 63° relative to a vertical direction, for a geometry with a pixel pitch equal in the vertical direction and a horizontal direction.

26. The device according to claim 22, wherein the motion detection is carried out, for a given pixel of the plurality of pixels, by a recursive calculation implementing an intermediate motion value loop M0 with attenuation by a factor of less than 1 and wherein a motion value M is determined for a pixel for interpolation X of a field m by the following algorithm:

M0=max(|A-D|,FA*M(N)),

Mp=min(M(N1),M(N1+1)),

M=max(M0,Mp),

where:

A is a pixel in a same position as a pixel X, but in a field m+1,

D is a pixel in a same position as the pixel X, but in a field m-1,

M(N) equates to a value M0 calculated one frame before, with N being a total number of lines in the image,

M(N1) equates to the value M0 calculated N1 lines before,

N1 = (N-1)/2 when N being odd-numbered,

N1 = (N-2)/2 when N being even-numbered and a luma lines for interpolation being a series of even numbered lines of the image,

N1 = N/2 when N being even-numbered and the luma lines for interpolation being a series of odd numbered lines of the image,

N1 = N/2 when N being even-numbered and the luma lines for interpolation being the series of odd numbered lines of the image, and

M(N1+1) equates to the value M0 calculated (N+1) lines before, and

FA is the attenuation factor.